# "TOMS-like" Total $O_3$ Algorithm (OMTO3) -A Status Report

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# Key Features

- Primary algorithm
  - Uses 2 wavelengths: mostly 318/331 nm (331/360 nm at large SZAs).
  - Uses long-term mean values for cloud ht, snow/ice, $O_3$ profile, and atm temperature.
- Corrections for sea-glint, aerosols, and profile shape.
- Pixels contaminated with volcanic $SO_2$ are flagged.

# Validation Strategy

- Focus on extreme events: large SZAs, intense aerosol events, very low or very high clouds, perturbed $O_3$ profiles, clouds over snow/ice etc.
- Compare with advanced algorithms: spectral fitting, optimal estimation.
- Do sensitivity tests using better cloud, $O_3$ profile and atm temp information.

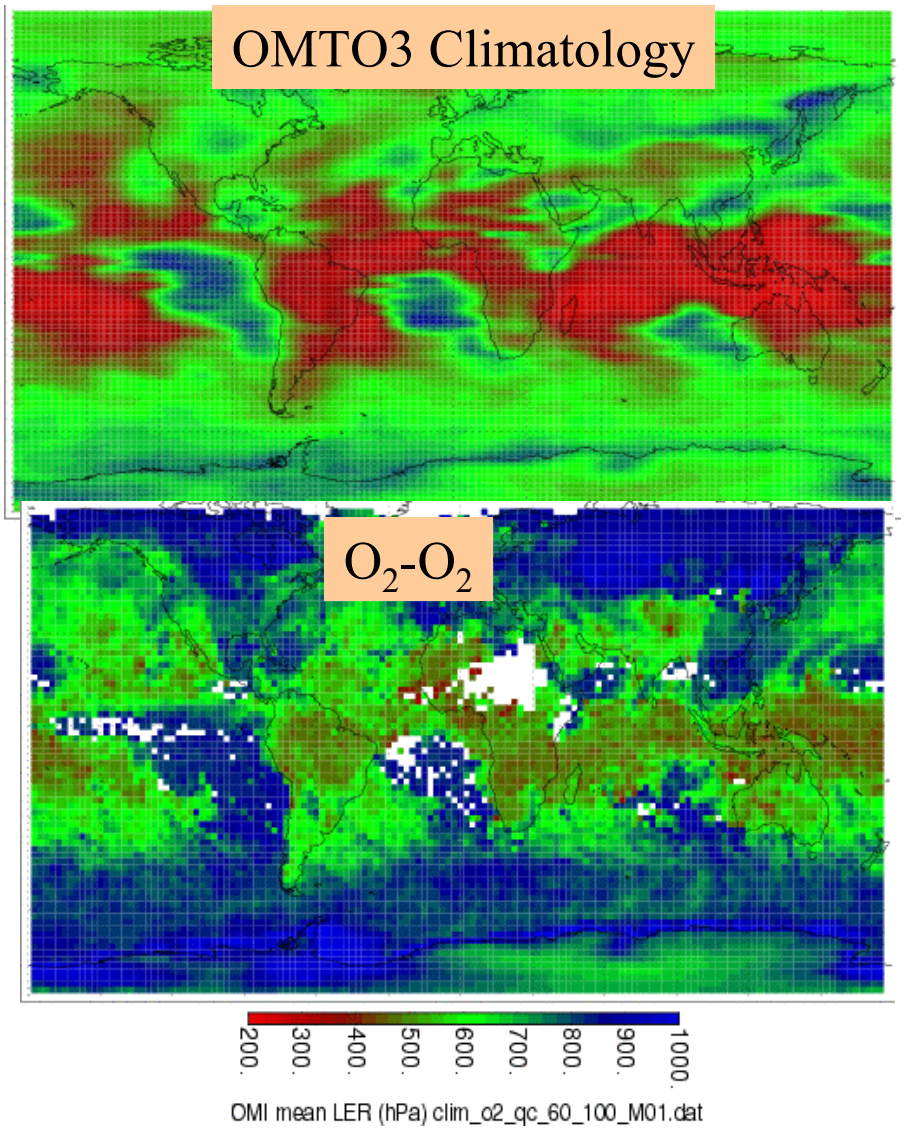
# Key Findings

- Sea-glint/aerosol correction scheme works well.
- $O_3$ profile errors are smaller than expected.
  - profile correction is applied when SZA>70˚- correction is often worse than the error!- change to slant $O_3$ column >2000 DU.
- Variations in cloud ht (w.r.t. to climatology) produce ~2% rms error under cloudy conditions.
  - up to 10% overestimation for low, bright clouds.
  - a software bug adds several % errors when clouds are too high (>8 km).
- $SO_2$ flagging scheme allows some contaminated data to pass through- needs to be tightened.

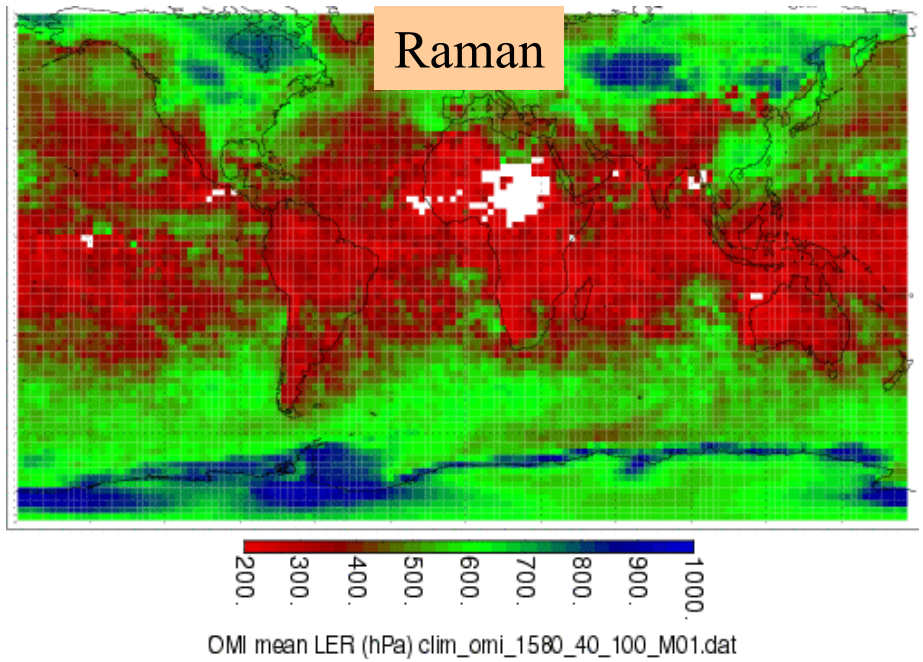
# Unresolved Issues

1) Where to get better cloud ht information?
   - Operational OMI $O_2$-$O_2$ cloud algorithm appears to be biased too low.
   - Operational Raman cloud ht algorithm is too noisy.
   - MODIS cloud ht information is biased towards ice clouds, which have relatively small effect on UV.

# Comparison of Cloud-top Pressures




On average, Raman cloud pressures agree better with climatology than $O_2$-$O_2$, but Raman sometimes produces unreasonably large (>sfc press) or small (<100 hPa) values.



# Unresolved Issues (cont'd)

2) Effects of clouds over snow/ice?
   - OMTO3 ignores them, OMDOAS attempts to correct for them. What is the best strategy?
3) Effect of instrument straylight on OMTO3?
4) Best $O_3$ absorption cross-sections to use?
   - temp dependence of Bass & Paur $O_3$ cross-sections have strange $\lambda$-dependence.

# Summary

- Globally, OMTO3 has ~2% rms accuracy, however errors of up to 10% do occur, typically for very bright, low clouds.
  - Next version of $O_2$-$O_2$ and/or Raman algorithms may provide data to reduce these errors significantly.
- Quality of OMTO3 data at SZA>80˚ remains unknown since nothing is currently available to validate them.
  - Satellite-quality algorithms applied to ground-based ZS measurements may solve this problem.